

Understanding synergies between structural distortions, chemical ordering, and the physical properties of perovskites

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Chemistry Colloquium on Perovskite Materials

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Bertelsmeyer

Hall B10

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Abstract: Among oxides and halides, perovskites are arguably the most important family of functional materials. The ubiquity and importance of perovskites is due in large part to the ease with which structural distortions can be accommodated and the various patterns of cation and anion (including vacancies) ordering that can be stabilized. In the first half of this talk I will review the various types of distortions that are found in the perovskite family—octahedral tilting, second order Jahn Teller distortions, chemical ordering, orientational ordering of molecular ions—and discuss the crystal chemistry that drives these distortions. I will then consider the synergies between different distortion modes and patterns of chemical ordering. In the second half of the talk I will highlight three recent case studies: (1) octahedral tilting and hydrogen bonding in layered hybrid halide perovskites, (2) electronic distortions in double perovskites containing $5d^1$ cations like Re(VI) and Os(VII), and (3) cation ordering in hexagonal perovskites.

About the speaker: **Patrick Woodward** received BS degrees in Chemistry and General Engineering from Idaho State University in 1991, an MS in Materials Science and a PhD in Chemistry from Oregon State University in 1996, where he studied under Professor Arthur Sleight. He was a postdoc in the Physics Department at Brookhaven National Laboratory (1996–1998) before joining the faculty at Ohio State University in 1998, where he is currently the Newman Professor of Chemistry and Biochemistry. His research interests revolve around the discovery of new materials and understanding links between the composition, structure and properties of extended solids. Professor Woodward has been recognized with NSF CAREER Award and as a Sloan Fellow. He has served as an Associate Editor of the Journal of Solid State Chemistry (2006-2011) and Vice President of the Neutron Scattering Society of American (2014-2018). He organized the 2009 North American Solid State Chemistry Conference and served as chair of the 2018 Gordon Research Conference on Solid State Chemistry. In 2020 he was named a Fellow of the American Chemical Society. He is co-author of two widely used textbooks, *Chemistry: The Central Science* and *Solid State Materials Chemistry*.